what we call the body bring about changes in what we call the mind. When we alter the one, we alter the other. If, as the whole past history of our science leads us to expect, in the coming years a clearer and deeper insight into the nature and condition of that molecular dance which is to us the material token of nervous action, and a fuller, exacter knowledge of the laws which govern the sweep of nervous impulses along fibre and cell, give us wider and directer command over the moulding of the growing nervous mechanism and the maintenance and regulation of the grown one, then assuredly physiology will take its place as a judge of appeal in questions not only of the body, but of the mind; it will raise its voice not in the hospital and consulting-room only, but also in the senate and the school.

One word more. We physiologists are sorely tempted towards self-righteousness, for we enjoy that blessedness which comes when men revile you and persecute you and say all manner of evil against you falsely. In the mother-country our hands are tied by an Act which was defined by one of the highest legal authorities as a 'penal' Act; and though with us, as with others, difficulties may have awakened activity, our science suffers from the action of the State. And some there are who would go still farther than the State has gone, though that is far, who would take from us even that which we have, and bid us make bricks wholly without straw. To go back is always a hard thing, and we in England can hardly look to any great betterment for at least many years to come. But unless what I have ventured to put before you to-day be a mocking phantasm, unworthy of this great Association and this great occasion, England in this respect at least offers an example to be shunned alike by her offspring and her fellows.

Michael Foster.

Cambridge University.

CHEMISTRY AT THE BRITISH ASSOCIATION.

The work of the Chemical Section of the British Association was inaugurated with the address of its President, Professor Ramsay: 'An Undiscovered Gas.' Starting with a discussion of the history of the various periodic relationships which have been shown to exist among the elements, and of the definition of the properties of unknown members of several of the Groups prior to their isolation, the attempt was made to establish the probability of the existence, and to prophesy the characteristics of an element, as yet unknown, forming a 'triad' with helium and argon. Between fluorine and manganese lies chlorine; between oxygen and chromium, sulphur; between nitrogen and vanadium, phosphorus; between carbon and titanium, silicon, etc. The intermediate element possesses an atomic weight greater, on the average, by 16 units than that of the lightest member of the triad, and less by 20 units than that of the heaviest. Between the lightest and the heaviest, therefore, the difference in atomic weight is approximately 36 units, which is also the difference between the accepted atomic weights of helium (4) and argon (40). "There should, therefore, be an undiscovered element between helium and argon, with an atomic weight 16 units higher than that of helium, and 20 units lower than that of argon, namely 20. And if this unknown element, like helium and argon, should prove to consist of monatomic molecules, then its density should be half its atomic weight, 10. And, pushing the analogy still farther, it is to be expected that this element should be as indifferent to union with other elements as the two allied elements."

Professor Ramsay next reviewed his various efforts to obtain the third member of the helium-argon triad. The most promising method—that of systematic diffusion of the individual gases—failed to show the

presence of any second gas in purified argon; from what has been known as 'pure helium,' however, this process finally isolated a heavier gas which showed the spectroscopic characteristics of argon. No experimental evidence has so far been obtained for a gas with a density of 10.

The address concludes with a discussion of the probable position of argon in the Periodic System, the argument being along the same lines as that previously put forward by the author in his work, 'The Gases of the Atmosphere.' Attention is called to the fact that the differences of the atomic weights of elements following one another in any one Series are quite irregular, varying in the Lithium Series from 1.0 to 3.0, in the Sodium Series from 1.0 to 3.5, etc. Again, in the Silver Series iodine undoubtedly follows tellurium, and yet all the recent determinations of the atomic weight of the latter element unite upon a figure almost a unit above that of iodine; just as density-determinations indicate an atomic weight for argon nearly one unit higher than that of potassium which *follows* it in the System. The author concludes that the relative weights of the atoms of elements, while indicating roughly their position in a perfect Periodic System, are not to be taken as the absolute criterion of their relative sequence. As it is not possible in this short review adequately to discuss this matter, the reader is referred to the author's own statement of the argument.*

In the course of the Meeting Professor Ramsay presented (1) a paper dealing with the process employed in the separation of gases of different densities by fractional diffusion, and (2)—for Mr. Morris Travers—a proof of the fact that the hydrogen evolved on heating minerals in a vacuum is due to the decomposition of water mechanically held and is not present in the form of any other compound. In a paper before the Physical Section he called attention to the great delicacy of refractivity-determinations as a means of deciding upon the purity of light gases.

The superiority of the oxalate method for the separation of thorium from the other elements with which it is usually associated was demonstrated by Professor Brauner, who also presented the results obtained in a redetermination of the atomic weight of the metal. Professor T. W. Richards reviewed his recent very important work upon the atomic weights of cobalt and nickel, explaining the methods of purification of the salts employed and the apparatus in which they were got ready for weighing. Professor Meslans gave an interesting exhibition of the properties of free fluorine prepared according to the method of Moissan, but in a vessel of copper, instead of platinum, and surrounded by a freezing-mixture of ice and solid carbon dioxide. A very brief paper by Professors Moissan and Dewar on some of the physical constants of liquid fluorine was read by Professor Meldola.

Other papers on inorganic chemistry were those of Mr. E. C. C. Baly, on the formation of a compound when mercury falls in a finely divided state through an atmosphere of oxygen, and which appears to contain the oxygen in the form of ozone; of Dr. C. A. Kohn, on the electrolytic determination of copper and iron in oysters, reminiscent of the recent 'oyster scare' in Great Britain; of Professor W. W. Andrews, on the great increase in the rapidity and accuracy of blowpipe determinations through the use of tablets of plaster of Paris instead of charcoal; of Professor Dunnington, on the occurrence of titanic oxide in soils; and of F. T. Shutt, on analyses of Canadian virgin soils.

In the field of organic chemistry the most interesting paper—perhaps the most striking communication presented at this meeting of

*SCIENCE, Oct. 1st, pp. 493–502.

the Association—was that of Professor Nef, on 'The Chemistry of Methylene,' only a portion of which, however, was read. The author, as a result of this and former work, claims among other things to have proved the existence of isomeric acetylenes, one of which is characterized by the presence of a bivalent carbon atom and should therefore be represented by the formula $= C : CH_2$. This substance and its derivatives are remarkable on account of their extraordinary instability, horrible odor and extremely poisonous properties—peculiarities shared in large measure by all compounds of bivalent carbon, among which the author includes the cyanides. By a continuation of the process of removing hydrogen, Professor Nef expects to isolate gaseous and liquid carbon, with molecular weights of 24 and 72, respectively! The publication of the full text of this remarkable paper will certainly be awaited with interest.

As the result of a careful research, Professor Freer brought forward further arguments in favor of the view advanced by Nef for the constitution of the aliphatic ketones and their metallic derivatives. Dr. Lehmann reported the production of benzene derivatives through the reduction of a 1:6 diketone formed by the condensation of benzil with two molecules of acetophenone. A paper on the 'Condensation-products of Aldehydes and Amides' was read by Dr. Kohn. A report of analyses of pre-carboniferous coals was presented by Professor W. H. Ellis.

Professor Roberts-Austen exhibited some photographs of the 'splash' produced by objects falling into molten metals, and intended to show the similarity of behavior in these and other liquids. Mr. Ramage explained a number of photographs of the spectra of minerals and metals, prepared by Professor Hartley and himself. Dr. W. L. Miller exhibited an apparatus designed to determine the vapor-tensions of liquid mixtures. Mr. W. L. T. Addison read a portion of an interesting paper on the formation of crystals. Short papers by Dr. Gladstone and Mr. Hibbert and by Dr. T. Waddell discussed the absorption of Röntgen rays by the light metals. The curious effects produced by certain metals upon a photographic plate when placed in contact with it, or even, in some cases, in its neighborhood, were discussed by Dr. W. J. Russell. In the mutual decomposition of hydrobromic and bromic acids, Professor James Walker finds an interesting case where the application of the theory of electrolytic dissociation furnishes a satisfactory explanation of the course taken by the reaction.

Two papers remain to be mentioned, that of Professor Andrews on 'Reform in the Teaching of Chemistry,' and that of Professor Meldola on 'The Rationale of Chemical Synthesis.' The latter was an attempt to find a common ground upon which the chemist and the physiologist could work, each along his own lines of research, and where, by united judicious effort, more rapid progress could be made into those mysterious regions now withholding from our eager quest so much of vast importance to mankind.

W. W. R.

GEOGRAPHY AT THE BRITISH ASSOCIATION.

The geographers of the United States and Canada have every reason to feel highly pleased with the reception given them at the Toronto meeting of the British Association. Every effort was made to have the visiting geographers feel that their hosts considered them, not guests, but fellow-workers. Nearly one-half of the general committee was composed of residents of North America, and one day was given over to papers concerning Canada and the United States. In all, nearly half of the papers presented were by Americans.